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THE USE OF SHRIMP WASTE CONCENTRATE IN FEED FORMULATION TO GROWTH RATE OF TILAPIA SEEDS (*OREOCHROMIS NILOTICUS*)

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ABSTRACT

Tilapia is one type of fish that is favored by various circles of Indonesian. This makes the cultivation of Tilapia continues to be a business opportunity so that continuous improvements are made that are closely related to the quality of good feed and to try balance the feed, the addition of shrimp waste concentrate was carried out.This study aims to determine and analyze using the level of shrimp waste concentrates in feed formulations that provide the best growth rate on tilapia seeds. The research method used was the experimental method using a Completely Randomized Design (RAL) consisting of 4 treatments addition of Solid Nutrition Concentrate (SNC) based shrimp waste and 4 replications, namely treatment A (SNC 0%), treatment B (SNC 2%), treatment C (SNC 4%), and treatment D (SNC 6%). The parameters observed were specific growth rate (SGR) and survival rate (SR). Results of the research that has been done it can be concluded that the addition of shrimp waste concentrate with 2% treatment on feed is able to provide the most effective and efficient results, namely the daily

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growth rate of 1.70 ± 0.05% and survival rate of 97.50 ± 5.00%, and the addition of shrimp waste concentrate can be made into a feed supplement in tilapia cultivation.

Keywords

Gradual fermentation technique, shrimp waste concentrate, specific growth rate, survival rate, tilapia

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Introduction

Tilapia is one type of fish that is favored by various circles of Indonesian society because of the thick meat and high nutritional content. Based on data from the Directorate General of Aquaculture (2018), Tilapia production in Indonesia in 2017 recorded to reach 1.15 million tons or an increase of 3.6% from 2016 which reached 1.14 million tons. This makes the cultivation of Tilapia continues to be a business opportunity so that continuous improvements are made that are closely related to the quality of good feed.

Good feed for growth in fish is very dependent on its protein content, because protein has an important role in body organs formation, structural performance and bodily functions (Murtidjo 2001). Good protein quality in feeding will affect the growth rate of Tilapia which is assessed based on body weight gain. A source of protein that often used and has a high nutritional value is fish meal. However, fish meal has an expensive price and its availability is limited, so alternative feed is an option to replace protein without reducing the quality. Alternative feed ingredients using vegetable feed ingredients. The disadvantage of this material is its digestibility and low protein content. Therefore, to try to balance the feed nutrition, the addition of shrimp waste concentrate was carried out.

Shrimp waste concentrate is a product of biological processing of shrimp waste with a gradual fermentation technique. Fermentation is carried out using *Bacillus licheniformis, Lactobacilus sp.,* and yeast in the form of *Saccharomyces cereviseae* (Abun et al. 2017). Fermentation is carried out using *Bacillus licheniformis, Lactobacilus* sp., And yeast containing *Saccharomyces cereviseae*. *Bacillus licheniformis* is a bacteria that has deproteination properties which will contain a portion of protein or nitrogen from chitin bonds because it has the enzyme khitinase and protease enzyme. *Lactobacilus* sp. has the function of breaking down sugar, sucrose, maltose and lactose so that it improves mineral deposits. *Saccharomyces cereviseae* is a yeast that produces amylase, lipase, protease, and other enzymes that can help digestion of nutrients in the digestive organs (Abun et al. 2017). The nutritional content of shrimp waste concentrate is Protein 39.29%, Fat 7.03%, Fiber 7.79%, Calcium 6.81%, Phosphorus 2.83%, Lysine 3.04%, and Methionine 1.46%, and 1.66% Organic Acid (Abun et al. 2018). The high and complete nutritional content of shrimp waste concentrates can balance the composition of feed raw materials and complement the deficiencies of amino acids, minerals and fatty acids in plant based feed. Therefore it is necessary to do research on the use of shrimp waste concentrates in feed formulations on growth rates in Tilapia seeds.

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The purpose of this study is to be able to determine and analyze the level of use of shrimp waste concentrates in feed formulations that provide the best growth rate on Tilapia seeds. The results of this study are expected to provide additional information and scientific knowledge that is beneficial to the scope of fisheries and education regarding the use of shrimp waste concentrates in feed formulations and their effects on the growth rate of Tilapia fish. The results of the study are also expected to be used as a reference for further research on shrimp waste concentrations.

Materials and method

Raw materials

Shrimp waste concentrate was obtained from the results of research by lecturers of Padjadjaran University, West Java, Indonesia (Abun *et al.* 2017). Fish meal, soybean, bran, wheat pollard, corn flour, fish oil, vitamine, and topioca were obtained from CV. Missouri Poultry located at Malabar Street No. 53, Lengkong, West Java, Indonesia. Tilapia seeds was obtained from Fish seed center in Cibiru, West Java, Indonesia.

Formulation and preparation of feeds

The making of feed begins with the formulation using the percent square method. The feed used for this research is artificial feed by adding shrimp waste concentrate with a percentage of 0%, 2%, 4%, and 6%. The composition of the feed ingredients used is fish meal, soybean meal, corn flour, bran, wheat pollard, vitamine, fish oil, and tapioca. The formulation can be seen in table 2. The feed material is filtered first to produce a smooth texture, then the feed is weighed according to the formulation. Making feed starts with mixing feed ingredients such as shrimp waste concentrate, fish meal, soybean meal, corn flour, bran, wheat pollard, vtamine and binder into the basin evenly, then added dissolved fish oil using warm water, then added water warm enough and stir until it forms solids. Then shaped with a pellet molding device, the molded pellets are dried using a drying machine for 24 hours.

Tabel 1. Proximates composition of shrimp waste concentrate

Nutrient	Contens (%)
Protein	39.29
Fat	7.03
Fiber	7.79
Calcium	6.81
Phosphorus	2.83

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Lysine	3.04
Methionine	1.46
Energy Basal (Kkal/Kg)	3379
Energy Metabolism (Kkal/Kg)	2614
Absorbed	72.91
Organic acid	1.66

Source : Abun *et al*. 2018

Tabel 2. Compostion of formulated feed

Materials	**Treatments (%)**			
	A	**B**	**C**	**D**
Shrimp waste concentrate (SNC)	0	2	4	6
Fish meal	21,49	20,68	19,88	19,08
Soybean meal	21,49	20,68	19,88	19,08
Corn flour	15,67	15,55	15,41	15,28
Bran	15,67	15,55	15,41	15,28
Wheat Pollard	15,67	15,55	15,41	15,28
Vitamine	4	4	4	4
Tapioca	5	5	5	5
Fish oil	1	1	1	1
Total	**100**	**100**	**100**	**100**
Protein	**25**	**25**	**25**	**25**

Feeding experiments

Four aquariums for each treatment (total of 16 aquariums), 160 juveniles were individually weighed (5.5±1.0g) and measured (6-7cm), the aquarium volume is 20 L and were filled with aerator and an exchange of 70% of the water volume at two day intervals. Tilapia seeds was initially maintained in fiber tub for a period of 7 days for acclimatization. Each aquarium was shared by ten juveniles (Yulianti *et al.* 2003), which were fed 3 times a day at 8.00, 12.00, and 16.00 WIB with a quantity of feed equivalent 5% of their weight, for a period of 30 days (BSNI 2009). At 6-day intervals, the weight, and length of each juvenile was measured to calculate gains.

Parameters observed

Growth Rate

The growth rate was observed by calculating the daily growth rate of tilapia seeds according to Effendie (2002) as follows:

$$SGR = \frac{\ln Wt - \ln Wo}{t} \times 100\%$$

Information :

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SGR = *Specific growth rate* (%)

Wt = Weight of tilapia seed at the end of observation (g)

Wo = Tilapia seed weight at the beginning of the observation (g)

t = Length of maintenance (days)

Survival Rate

Survival rate is observed using the calculation of parameter survival rates according to Effendie (2002) as follows:

$$KH = \frac{Nt}{No} \times 100\%$$

Information:

SR = Survival Rate (%)

Nt = Number of tilapia seeds that live at the end of the observation (unit)

No = Number of tilapia seeds at the beginning of the observation (unit)

Statystical analysis

Data analysis was performed statistically to determine the effect of each treatment using variance analysis with the F test. If there were significant differences between treatments followed by Duncan's multiple distance test (LSR test) with a level of 95%.

RESULTS AND DISCUSSION

The Effect of Shrimp Waste Concentrate in Specific Growth Rate (SGR)

Growth can be interpreted as an increase in the size of length or weight at a time and is a complex biological process in which many factors influence it (Effendie 2002). One of the external factors that influence growth is feed and can be seen its effect on growth (Table. 3)

Tabel 3. Specifik Growth Rate (SGR) of Tilapian Seeds

Treatment	SGR (%)
A (SNC 0%)	$1{,}45 \pm 0{,}08^{a}$
B (SNC 2%)	$1{,}70 \pm 0{,}05^{bc}$
C (SNC 4%)	$1{,}98 \pm 0{,}03^{c}$
D (SNC 6%)	$1{,}67 \pm 0{,}08^{b}$

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Based on the results of analysis of variance, there were significant differences between the treatment of addition of shrimp waste concentrate and daily growth rate at the 95% confidence level ($p < 0.05$). Treatment A (SNC 0%) has a daily growth rate of 1.45±0.08%, while in the feed which was given with treatment, the addition of shrimp waste concentrates mostly shows a greater daily growth rate as in treatment B (SNC 2%) with a daily growth rate of 1.70±0.05%, treatment C (SNC 4%) of 1.98±0.03%, and treatment D (SNC 6%) of 1.67±0.08% . The highest growth rate of tilapia seed is found in treatment C (SNC 4%) which is 1.98±0.03% and the lowest is in treatment A (SNC 0%) which is 1.45±0.08%. At treatment B (SNC 2%) shows the value of the daily growth rate that is not significantly different from treatment C (SNC 4%), so the treatment is quite effective at treatment B (SNC 2%). This indicates that the tilapia seeds in treatment B (SNC 2%) nutritional needs are quite effectively provided. Addition of feed supplements containing 2% *Bacillus sp* produced the highest daily growth rate in tilapia seeds (Abadi 2009).

The results of the daily growth rate of tilapia seeds can be seen in Table. 3 shown that the feed given the addition of shrimp waste concentrate has a better daily growth rate than if without the addition of shrimp waste concentrate. Shrimp waste concentrate has a high nutritional value so that it supports fish growth. Fish growth will be fast and fish size will be larger if the nutritional content of the feed provided meets their needs (Puspasari 2015). The presence of 3 types of microorganisms in the SNC manufacturing process improves nutrient quality in SNC, so that growth can occur by increasing. *Bacillus licheniformis* produces the enzyme khitinase and protease enzyme with deproteination properties wherein the enzyme degrades β (1,4) glycosidic bonds in chitin and will free some proteins in the form of N-acetyl-D-glucosamine and acetyl amino monomers so that the protein is released from the chitin bond and detachment of protein in the form of amino acids causes the protein and amino acid content to increase in shrimp waste (Rahayu et al. 2004). *Lactobacillus* sp serves to break down glucose, sucrose, maltose and lactose into lactic acid so that mineral deposits occur. *Sacharomyces cereviseae* is a yeast that produces amylation enzymes, lipases, proteases and other enzymes that can help digestion of nutrients in the digestive organs (Abun et al. 2017).

The decrease in the daily growth rate or the weight of this is allegedly because the SNC enhancer 2% produces the most optimal nutrient content and the greater the addition of SNC followed by the increase in the number of microbes and mineral content, because the more microbes that live in the digestive tract of fish cause accumulation of metabolites (lactic acid, antioxidants and bacteriocin) produced by microbes as a self-defense mechanism because it is pressured by the high number of bacteria that exist so that it will ultimately inhibit growth

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(Utami 2009). The number of probiotic microbes that are too much will cause microbes to experience sporulation (forming spores) so that the function and activity of probiotics as a producer of enzymes is not optimal and is unable to produce enzymes that play a role in helping digestion (Utami 2009).

The Effect of Shrimp Waste Concentrate in Survival Rate (SR)

The survival rate of tilapia fish in each treatment with a maintenance period of 30 days showed values ranging between 90.00 - 97.50% (Table 4) According to the Indonesian National Standardization Agency (BSNI 2009), Survival rate (SR) standards for fish survival good SR is a minimum of 75%.

Tabel 4. Srvival Rate (SR) of Tilapia seeds

Treatment	SR (%)
A (SNC 0%)	90,00 ± 11,55[a]
B (SNC 2%)	97,50 ± 5,00[a]
C (SNC 4%)	92,50 ± 9,57[a]
D (SNC 6%)	92,50 ± 9,57[a]

Based on the results of analysis of variance there were no significant differences between the treatment of additional shrimp waste concentrates on feed and survival rates of tilapia fish at the 95% confidence level ($p > 0.05$) which can be seen in Table 4. in treatment A (SNC 0 %) has the lowest survival rate of 90.00 ± 11.55%, treatment B (SNC 2%) with the highest survival rate of 97.50±5.00%, Treatment C (SNC 4%) and Treatment D (SNC 6%) with a survival rate of 92.50±9.57%. The survival rate of tilapia seeds shows that the feed given by the addition of shrimp waste concentrate has a better survival rate than if without the addition of shrimp waste concentrate. The addition of shrimp waste concentrates on feed has a survival standard quality value that is classified as a good quality standard according to the BSNI 2009.

It is suspected that the role of 3 types of microbes as probiotics is obtained from the gradual fermentation process in the manufacture of shrimp waste concentrates. The use of probiotics will directly increase the effectiveness of intestinal microbes that can increase growth (Haetami *et al.* 2008). Provision of probiotics in feed is generally intended to provide health to the digestive tract through the balance of bacteria in the digestive tract and stimulation of immune function (Sudarmono 2013). The ability of microbes to be beneficial in inhibiting the

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development of pathogenic microbes shows their ability to maintain microflora balance in the digestive tract of fish (Setiawati *et al.* 2013).

Treatment B (SNC 2%) has the highest survival value. This is in accordance with the results of the study of Hadi *et al*. 2009 where the addition of fermented shrimp waste flour by 2.5% shows the greatest survival value of tilapia seeds and based on the results of Ariati's research (2013) the addition of shrimp waste flour as much as 5% on feed has the highest survival value of sangkuriang catfish seeds with a value of 96.67%. Factors that influence the high and low of survival include competitors, density, population, age, and the ability of organisms to adapt to their environment (Effendie 2002).

CONCLUSION

Based on the results of the research that has been done it can be concluded that the addition of shrimp waste concentrate with a treatment of 2% on feed is able to provide the most effective and efficient results, namely the daily growth rate of 1.70±0.05%, and survival is 97.50±5.00%. Addition of shrimp waste concentrate can be made into a feed supplement in tilapia cultivation.

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